CLAIMS

1. An electrochemical device, comprising:

a gas diffusion electrode comprising a carbonaceous material and a catalytic layer formed on at least a portion of a surface of the carbonaceous material, the carbonaceous material having at least a first surface region and a second surface region, wherein an amount of the catalytic layer formed on the first surface region is lesser than an amount of the catalytic layer formed on the second surface region; and

a proton conduction unit in contact with the first surface region of the gas diffusion electrode.

2. The electrochemical device as claimed in claim 1, wherein the electrochemical device is a fuel cell.

3. The electrochemical device as claimed in claim 1, wherein the electrochemical device is an air cell.

4. The electrochemical device as claimed in claim 1, wherein the carbonaceous material comprises a fibrous material composed of carbon.

5. The electrochemical device as claimed in claim 4, wherein the fibrous material composed of carbon contains at least a graphite material having a fibrous structure.

6. The electrochemical device as claimed in claim 4, wherein the fibrous material composed of carbon comprises a carbon material having a tubular structure.

7. The electrochemical device as claimed in claim 1, wherein the catalytic layer comprises a material selected from the group consisting of platinum, platinum alloys, palladium, magnesium, titanium, manganese, lanthanum, vanadium, zirconium, nickel, lanthanum alloys, titanium-iron alloys, iridium, rhodium, gold and combinations thereof.

8. A method for preparing an electrochemical device, the method comprising the steps of:

providing a sheet of a carbonaceous material;

forming a catalytic layer on a first portion of the sheet of carbonaceous material; and

applying a proton conduction unit on a second portion of the sheet of carbonaceous material.

9. The method as claimed in claim 8, wherein the carbonaceous material comprises a fibrous material composed of carbon.

10. The method as claimed in claim 9, wherein the fibrous material composed of carbon contains at least a graphite material having a fibrous structure.

11. The method as claimed in claim 9, wherein the fibrous material composed of carbon comprises a carbon material having a tubular structure.

12. The method as claimed in claim 9, wherein the step of providing the sheet of carbonaceous material includes the step of introducing the fibrous material composed of carbon into a liquid suspension thereby filtering the fibrous material composed of carbon to form the sheet of carbonaceous material.

13. The method as claimed in claim 8, wherein the step of forming the catalytic layer includes forming the catalytic layer by a sputtering method.

14. The method as claimed in claim 8, wherein the step of forming the catalytic layer includes forming the catalytic layer by a vacuum vapor deposition method.

15. The method as claimed in claim 8, wherein the step of forming the catalytic layer includes forming the catalytic layer by a pulse laser deposition method.

16. The method as claimed in claim 8, the method further comprising the step of applying a sheet of a carbon-based material to a portion of the sheet of carbonaceous material.

17. An electrochemical device, comprising:

a gas diffusion electrode comprising a carbonaceous material and a catalytic layer formed on at least a portion of the carbonaceous material; and

a proton conduction unit contacting the gas diffusion electrode such that at least a portion of the carbonaceous material is embedded within the proton conduction unit, wherein an amount of the catalytic layer is less in the embedded portion of the carbonaceous material than in a portion of the carbonaceous material that is not embedded within the proton conduction unit.